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# Construction and Application of Investment Risk Evaluation Model for Geothermal New Energy Industry

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# ABSTRACT

Geothermal new energy is a clean, efficient, and sustainably developable form of energy with significant economic benefits and broad development potential. Supported by robust national policies, the geothermal new energy industry has attracted substantial private capital investment. However, due to the lack of scientific risk assessment tools, private investors often rely solely on financial forecasting analyses, neglecting comprehensive consideration of policy, market, and systemic risks, which has led to a high rate of investment failures. Moreover, research on investment risks in geothermal new energy remains insufficient, highlighting the need to develop a scientific investment risk assessment system with significant theoretical and practical value.

This study focuses on geothermal new energy investment. It begins by systematically identifying the main risk factors faced by private capital investment, including policy risks, market risks, and technical risks. Subsequently, the study introduces the AHP (Analytic Hierarchy Process) to construct a preliminary risk assessment model comprising five primary indicators and 18 secondary indicators. Recognizing the limitations of AHP in fully quantifying risks under complex and dynamic environments, the author combines it with the characteristics of the geothermal new energy industry to propose an integrated assessment model: the "AHP-Fuzzy Mathematics Evaluation-Scenario Simulation" framework. This model enhances the scientific rigor and dynamic adaptability of the assessment. Through empirical analysis of Z Company's geothermal new energy investment case, the reliability and applicability of the integrated assessment model are validated. The results demonstrate that the model not only quantitatively assesses risks comprehensively but also dynamically simulates the impacts of policy or market changes on investment risks, proving its high value for broader applications.

The primary contribution of this study lies in the innovative integration of AHP, fuzzy mathematics evaluation, and scenario simulation methods, achieving a hierarchical, specific, and dynamic approach to risk assessment. The constructed integrated assessment model addresses the shortcomings of traditional methods, providing a scientific risk assessment tool for private capital investment in geothermal new energy projects. Additionally, it offers new theoretical and practical references for risk management research in the renewable energy industry, showcasing significant innovative value and practical significance.

Key words: Geothermal New Energy; Investment; Risk Assessment; Analytic Hierarchy Process; Fuzzy Mathematics; Scenario Simulation

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